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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
09/915,531	07/27/2001	Norman Chang	10004741-1	8998

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HEWLETT-PACKARD COMPANY
Intellectual Property Administration
P.O. Box 272400
Fort Collins, CO 80527-2400

EXAMINER	
CONNOLLY, MARK A	
ART UNIT	**PAPER NUMBER**
2115	

DATE MAILED: 01/21/2005

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary	Application No.	Applicant(s)	
	09/915,531	CHANG ET AL.	
	Examin r	Art Unit	
	Mark Connolly	2115	

-- The MAILING DATE of this communication appears on th cover sh t with the correspondenc address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *amendments filed 15 November 2004*.

2a)☒ This action is **FINAL**. 2b)☐ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1-23* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *1-16 and 19-23* is/are rejected.

7)☒ Claim(s) *17 and 18* is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☒ The drawing(s) filed on *15 November 2004* is/are: a)☒ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☐ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☐ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08) Paper No(s)/Mail Date _____.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____ .
5) ☐ Notice of Informal Patent Application (PTO-152)
6) ☐ Other: _____.

DETAILED ACTION

1. Claims 1-23 have been presented for examination.

2. Applicant's arguments with respect to claims 1-23 have been considered but are moot in view of the new ground(s) of rejection.

Claim Rejections - 35 USC § 103

3. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

4. Claims 1, 5-13 and 19-23 are rejected under 35 U.S.C. 103(a) as being unpatentable over Dillon US Pat No 6559701 in view of Westhead et al [Westhead] "A comparison of heuristic search algorithms for molecular docking."

5. Referring to claim 1, Dillon teaches the invention substantially including:

a. executing an optimization algorithm, to arrive at a set of delay values that at least approximately meet a criteria while satisfying timing constraints associated with selected pairs of logically connected clock sinks such that clock signals to clock sinks are synchronized [col. 4 lines 19-26 and 45-50]. In summary, Dillon teaches adjust timing constraints through delay cells in order to satisfy setup and hold timing for a system through the use of genetic algorithms. The criteria is interpreted as balancing a clock tree and satisfying setup and hold times within the clock tree is interpreted as satisfying timing constraints associated with selected pairs of logically connected clock sinks. Although Dillon states that "the present invention attempts to minimize the rate of change

in the activity in the design by intentionally skewing the clock arrival times of the switched elements" as pointed out by applicant, Dillon also explicitly states that "the same techniques which have been used to balance a conventional tree can be used to introduce... skew" [col. 4 lines 27-32 and 46-48].

Although Dillon teaches executing an optimization algorithm in order to adjust he delays, Dillon does not explicitly teach determining an initial set of delays and that the optimization algorithm randomly modifies the delay values.

Westhead explicitly teaches using a genetic algorithm. Westhead teaches that a genetic algorithm determines an initial set of values and also that the algorithm randomly modifies those values [Fig. 6 page 216]. It is obvious that the Dillon system would comprise the teachings of Westhead because Dillon explicitly teaches that genetic algorithms can be used to adjust delay timing in order to balance a clock tree as stated above. It is obvious that the determined initial values would be delay values in the Dillon-Westhead system because the delay values are what the genetic algorithm is adjusting in order to balance the clock tree.

6. Referring to claim 5, Dillon teaches using a genetic algorithm.

7. Referring to claim 6, The Dillon-Westhead system determines multiple initial delay values. More specifically, delay values must be determined for an entire tree and different delay values would be detected for each branch of that tree.

8. Referring to claim 7, Westhead teaches:

a. selecting parent values [step 2(c) fig. 6 page 216].

b. crossing over to produce child values [step 2(d) fig. 6 page 216].

c. mutating the child values [step 2(e) fig. 6 page 216].

d. evaluating the child values [step 2(f) fig. 6 page 216].

e. discarding the child values based on the evaluating step [step 2(f) fig. 6 page 216].

9. Referring to claim 8, Westhead teaches conducting a random tournament [steps 2(c-f) fig. 6 page 216]. In summary, Westhead teaches selecting random parents and thus selecting random children, making adjustments and making a comparison to replace values which do not meet a criteria.

10. Referring to claim 9, Westhead teaches dividing the parents randomly and randomly swapping their corresponding regions which result in swapped children [step 2(d) fig. 6 page 216].

11. Referring to claim 10, Westhead teaches adding a Gaussian random variable with a predetermined variance [step 2(e)(ii) fig. 6 page 216].

12. Referring to claim 11, Westhead teaches calculating an objective function for the child set and determining if the timing constraints are met. The objective in the Dillon-Westhead system is to have balanced delays. If the child set does not fit this criteria then the child set is replaced.

13. Referring to claim 12, Westhead teaches that the selecting, crossing over, mutating, evaluating and discarding steps are performed iteratively [fig. 6 page 216].

14. Referring to claim 13, the Dillon-Westhead system teaches that "a number of methods can be used to search the solution space" in order to optimize the system [col. 4 lines 22-23 *in Dillon*]. Dillon teaches genetic algorithms and simulated annealing algorithms as examples of algorithms that can be used for optimization. Gradient search algorithms are also well known in the art as optimization algorithms and it is well known that gradient search algorithms can be

used in place of a genetic or simulated annealing algorithm. Therefore, it would have been obvious to one of ordinary skill in the art to modify the Dillon-Westhead system to include the use of a gradient search algorithm as the optimization algorithm because it is well known in the art that a gradient search algorithm can be used to search the same solution space.

15. Referring to claims 19-23, these are rejected on the same basis as set forth hereinabove. Dillon and Westhead teach the method and therefore teach the system and the program embedded on a computer readable medium performing the method.

16. Claims 2-4 and 14-16 are rejected under 35 U.S.C. 103(a) as being unpatentable over Dillon and Westhead as applied to claims 1, 5-13 and 19-23 above, and further in view of Applicants Admitted Prior Art [AAPA].

17. Referring to claims 2-4, the Dillon-Westhead system requires an initial solution in order to initially execute the genetic algorithm [step 1 fig. 6 page 216 *of Westhead*]. The Dillon-Westhead does not explicitly teach a particular method of determining those initial solutions. The AAPA teaches that random solutions and those determined by linear or quadratic programming algorithms "*are well known*" in the art [emphasis added page 8 lines 14-16]. It would have been obvious to one of ordinary skill in the art to use the methods taught by the AAPA to determine the initial delay values in the Dillon-Westhead system, regardless whether those methods typically converge on a correct solution or not, because it provides a starting point for the genetic algorithm to begin wherein the genetic algorithm would converge on the final correct solution.

18. Referring to claim 14, the AAPA teaches that gradient search algorithms which the AAPA states "*are known*" [page 11 line 1]:

a. perturbs a set of delay values [page 10 lines 16].

b. evaluates how well the perturbed set of delay values meets a critera [page 10 lines 20-23].

c. conditionally discards the perturbed set on the basis of the evaluating step [page 10 lines 23-24].

19. Referring to claim 15, the AAPA teaches that a gradient search algorithm:

a. iteratively repeats the perturbing, evaluating and discharging steps [page 10 lines 24-26].

b. if the perturbed set is not discarded, then adjusting the values of the perturbed set in the same direction relative to the corresponding values in the initial set [page 10 lines 23-28].

20. Referring to claim 16, the AAPA teaches that a gradient algorithm randomly perturbs the initial set of values [page 10 lines 16-17].

Allowable Subject Matter

21. Claims 17 and 18 are objected to as being dependent upon a rejected base claim, but would be allowable if rewritten in independent form including all of the limitations of the base claim and any intervening claims.

Conclusion

22. Applicant's amendment necessitated the new ground(s) of rejection presented in this Office action. Accordingly, **THIS ACTION IS MADE FINAL**. See MPEP § 706.07(a). Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the date of this final action.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Mark Connolly whose telephone number is (571) 272-3666. The examiner can normally be reached on M-F 8AM-5PM (except every first Friday).

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Thomas C Lee can be reached on (571) 272-3667. The fax phone number for the organization where this application or proceeding is assigned is 703-872-9306.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

Mark Connolly
Examiner
Art Unit 2115

mc
January 11, 2005

THOMAS LEE
SUPERVISORY PATENT EXAMINER
TECHNOLOGY CENTER 2100